

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD

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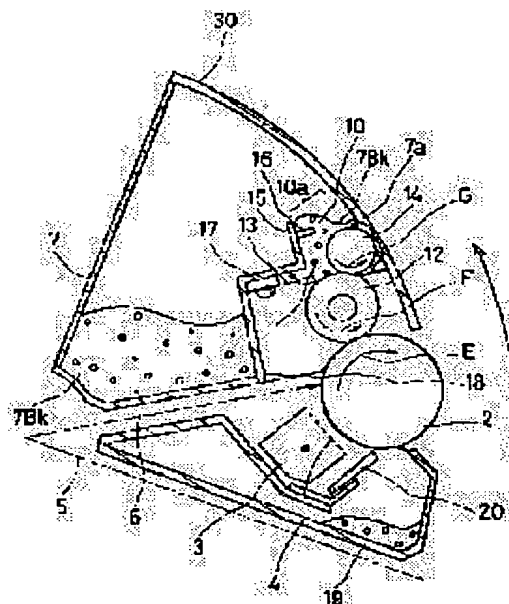
(72)Inventor : KOMAGINE HIROSHI  
HAYASHI KAZUMASA  
TAKEUCHI KEIZO  
TANI SHIGEMITSU

## (54) COLOR IMAGE FORMING DEVICE AND PROCESSING UNIT USED THEREFOR

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a superior color image forming device unit by which an unevenness in density or a fogging is not caused even in an environment of high temperature and high humidity and even after printing many sheets, and to provide a processing unit to be used therefor.

**SOLUTION:** A toner holding chamber 10 is formed to temporarily hold black toner 7Bk in the vicinity of a feeding roll 14 is formed in a developing part 30. The toner holding chamber 10 is formed of an exterior wall 7a of a toner hopper 7 and a toner holding wall 15 and an opening 10a communicating with the toner storing chamber of the toner hopper 7 is provided in this toner holding chamber 10. Furthermore, a toner retaining wall 16 is provided in the toner holding chamber 15 so that a part of the opening 10a is shielded. The toner retaining wall 16 is installed so that the black toner 7Bk of the feeding part S that is in the vicinity of a part where the feeding roll 14 and a developing roll 12 are brought close together among the black toner 7Bk in the toner holding chamber 10 is surrounded.



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## CLAIMS

[Claim(s)]

[Claim 1] Color picture formation equipment characterized by providing the following Two or more process units which contain the toner of a color with which each differs, and have a photo conductor and a development means at least, and were arranged in a circle as a whole A move means to rotate two or more aforementioned process units in one, and to move each process unit to a predetermined image formation position one by one The toner hopper with which it has a synthetic means to compound a color image for the toner image of a color which is different on the aforementioned photo conductor in the aforementioned image formation position in piles, and the aforementioned development means accumulates a toner A toner maintenance means to always hold the toner of the specified quantity to the toner feed zone whose aforementioned development means it is color picture formation equipment which has at least the toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating, and a toner supply means to supply a toner to the aforementioned toner support, and is near the proximity section of the aforementioned toner support and the aforementioned toner supply means further

[Claim 2] Two or more process units which contain the toner of a color with which each differs, and have a photo conductor and a development means at least, and were arranged in a circle as a whole, A move means to rotate two or more aforementioned process units in one, and to move each process unit to a predetermined image formation position one by one, The toner hopper with which it has a synthetic means to compound a color image for the toner image of a color which is different on the aforementioned photo conductor in the aforementioned image formation position in piles, and the aforementioned development means accumulates a toner, The toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating, It is color picture formation equipment which has at least a toner supply means to supply a toner to the aforementioned toner support, So that the toner of the toner feed zone which it is near the proximity section of the aforementioned toner support and the aforementioned supply means may not return during rotation operation of the aforementioned process unit by the aforementioned move means at the aforementioned toner hopper Color picture formation equipment characterized by intercepting a part of opening which leads to the toner receipt room of the aforementioned toner hopper from the aforementioned toner feed zone.

[Claim 3] Color picture formation equipment according to claim 2 with which the toner maintenance wall was prepared in the aforementioned toner hold wall so that a toner feed zone might be formed with the outer wall section and the toner hold wall of a toner hopper and a part of opening which leads to the toner receipt room of the aforementioned toner hopper from the aforementioned toner feed zone might be intercepted.

[Claim 4] Two or more process units which contain the toner of a color with which each differs, and have a photo conductor and a development means at least, and were arranged in a circle as a whole, A move means to rotate two or more aforementioned process units in one, and to move each process unit to a predetermined image formation position one by one, The toner hopper with which it has a synthetic means to compound a color image for the toner image of a color

which is different on the aforementioned photo conductor in the aforementioned image formation position in piles, and the aforementioned development means accumulates a toner, The toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating, [ when it has further an accumulation means to be color picture formation equipment which has at least a toner supply means to supply a toner to the aforementioned toner support, and to accumulate the printing number of sheets of a monochrome image and carries out continuation formation of the monochrome image ] It is color picture formation equipment characterized by carrying out predetermined angle rotation of the aforementioned process unit from after a printing end before the next printing start when the accumulation number of sheets of the aforementioned accumulation means comes during printing more than the predetermined number of sheets A.

[Claim 5] Furthermore, it is color picture formation equipment according to claim 4 which was made to perform the remaining printing once carrying out predetermined angle rotation of the process unit, when the accumulation number of sheets of an accumulation means turns into the predetermined number of sheets B (B>A) during printing.

[Claim 6] Color picture formation equipment according to claim 4 or 5 which resets the accumulation number of sheets of an accumulation means at the same time it carries out predetermined angle rotation of the process unit.

[Claim 7] Color picture formation equipment according to claim 4 which enabled it to set up the value of A freely.

[Claim 8] Color picture formation equipment according to claim 5 which enabled it to set up the value of B freely.

[Claim 9] The process unit characterized by providing the following The toner hopper with which it has a photo conductor and a development means at least, and is equipped possible [ a rotation ] in color picture formation equipment, and the aforementioned development means accumulates a toner while containing a toner The toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating A toner maintenance means to always hold the toner of the specified quantity to the toner feed zone whose aforementioned development means it is the process unit which has at least a toner supply means to supply a toner to the aforementioned toner support, and is near the proximity section of the aforementioned toner support and the aforementioned toner supply means further

[Claim 10] The toner hopper with which it has a photo conductor and a development means at least, and is equipped possible [ a rotation ] in color picture formation equipment, and the aforementioned development means accumulates a toner while containing a toner, The toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating, It is the process unit which has at least a toner supply means to supply a toner to the aforementioned toner support, rotational motion --- the process unit characterized by intercepting a part of opening which leads to the toner receipt room of the aforementioned toner hopper from the aforementioned toner feed zone so that the toner of the toner feed zone which it is near the proximity section of the aforementioned toner support and the aforementioned supply means may not return to the aforementioned toner hopper in appearance in the work [Claim 11] Color picture formation equipment according to claim 10 with which the toner maintenance wall was prepared in the aforementioned toner hold wall so that a toner feed zone might be formed with the outer wall section and the toner hold wall of a toner hopper and a part of opening which leads to the toner receipt room of the aforementioned toner hopper from the aforementioned toner feed zone might be intercepted.

[Translation done.]

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]  
[The technical field to which invention belongs] this invention relates to the process unit used for the color picture formation equipment and it applicable to a color printer, a color copying machine, or color facsimile which are color electrophotography equipment.

[0002]  
[Description of the Prior Art] Generally the method of facing forming a color picture, piling up yellow, a Magenta, cyanogen, and the toner image of each color of black on imprint material with electrophotography, and forming a color picture is used. Thus, as color electrophotography equipment which piles up the toner image of each color and outputs a color picture, various kinds of equipments are proposed by present. For example, the color electrophotography equipment of the new composition which is not until now is indicated by JP.7-36246A. Hereafter, this color \*\*\*\*\* is explained about \*\*, referring to drawing 7. Drawing 7 is the sectional side elevation showing the whole color electrophotography equipment composition indicated by the above-mentioned official report.

[0003] As shown in drawing 7, mostly, 4 sets of process-unit 101Bk(s) of this color electrophotography equipment whose cross sections for each colors of black, yellow, a Magenta, and cyanogen are sector image formation units in a center, and 101Y, 101M and 101C are arranged, and the process-unit group is constituted by these process-unit 101Bk(s), and 101Y, 101M and 101C. Two or more process-unit 101Bk(s), and 101Y, 101M and 101C are arranged in a circle, each -- process-unit 101Bk, and 101Y, 101M and 101C are equipped with the composition members of a photo conductor, the development counter which contained the toner of each color, and a cleaner main [ three ]

[0004] Process-unit 101Bk arranged in a circle, and 101Y, 101M and 101C are supported by the base material (not shown), and can be rotated in the direction of arrow X around the cylinder-like shaft 122. each -- one by one, a photo conductor moves to the image formation position 150 which countered the middle imprint belt 132, and process-unit 101Bk, and 101Y, 101M and 101C are positioned. This image formation position 150 is also an exposure position where the signal light 105 exposes a photo conductor.

[0005] The laser aligner 123 generates the signal light 105 which is the laser beam modulated by the signal inputted into the printer section. In the state which showed in drawing 7, this signal light 105 passes the optical path formed between process-unit 101Y for yellow, and process-unit 101M for Magentas, and it carries out incidence to the mirror 124 fixed to the interior of a shaft 122 through the transparent aperture by which opening was carried out to some shafts 122. The signal light 105 reflected by the mirror 124 is irradiated by the photo conductor of process-unit 101Bk for blacks in the image formation position 150. Thereby, a latent image is formed in the photo conductor of process-unit 101Bk.

[0006] The middle imprint belt 132 is constituted by the film which made the base material the urethane of half-conductivity of the shape of an endless belt whose thickness is 100 micrometers. This middle imprint belt 132 is \*\*\*\*(ed) by the imprint roller 133 and the roller 134 made from stainless steel, and is movable in the direction of arrow Y. The urethane foam to

which low resistance processing was performed is formed in the superficies of the imprint roller 133.

[0007] The pressure welding of the imprint roller 133 is lightly carried out to the photo conductor of process-unit 101Bk for blacks which is in the image formation position 150 through the middle imprint belt 132. Near the roller 134, the 2nd imprint roller 135 is formed possible [ follower rotation ], and the pressure welding of this 2nd imprint roller 135 is lightly carried out to the middle imprint belt 132.

[0008] The form conveyance way is formed in the nip section in which the middle imprint belt 132 and the 2nd imprint roller 135 are carrying out the pressure welding so that a form may be sent from the feed section 136.

[0009] The fixing assembly 144 is arranged at the downstream of the form sent from the nip section of the middle imprint belt 132 and the 2nd imprint roller 135, and this fixing assembly 144 is fixed to the toner image on the form after an imprint.

[0010] Next, operation at the time of the color image formation in the above-mentioned conventional color electrophotography equipment is explained.

[0011] an initial state -- setting -- each -- process-unit 101Bk, and 101Y, 101M and 101C are arranged in the position as shown in drawing 5. That is, process-unit 101Bk for blacks is arranged in the image formation position 150, and is in the state where the photo conductor of process-unit 101Bk countered some middle imprint belts 132. In this state, incidence of the signal light 105 for blacks is carried out to process-unit 101Bk from the laser aligner 123, and image formation by the black toner is performed on a photo conductor.

[0012] When the toner image of black is formed on a photo conductor as mentioned above, the toner image of black is imprinted also on the middle imprint belt 132. Immediately after all the toner images of black were imprinted by the middle imprint belt 132, the 90 degrees of the whole process-unit group rotate in the direction of arrow X of drawing 5 in one. And process-unit 101C for cyanogen stops in the image formation position 150, and the photo conductor of process-unit 101C is positioned.

[0013] above -- cyano one -- process-unit 101Bk for the above-mentioned blacks after process-unit 101C of business was positioned in the image formation position 150 -- the same -- cyano one -- incidence of the signal light 105 of business is carried out to process-unit 101C, and the toner image of cyanogen is formed on a photo conductor, and is imprinted by the middle imprint belt 132. Thus, when the toner image of cyanogen is imprinted by the middle imprint belt 132, the middle imprint belt 132 is controlled to rotate one and to be arranged so that the toner image of the black imprinted before serves as a toner image of cyanogen, and a corresponding position.

[0014] The same imprint operation as the above is performed one by one also about the following Magenta and yellow, on the middle imprint belt 132, the toner image of four colors agrees in position, it piles up, and a color image is formed. After the toner image of the last yellow is imprinted on the middle imprint belt 132, the package imprint of the color image with which four colors lapped is carried out with the 2nd imprint roller 135 at the form sent from the feed section 136 according to the formation timing of the color image. And a fixing assembly 144 is fixed to the color image imprinted by the form.

[0015]

[Problem(s) to be Solved by the Invention] However, there were the following problems in the color picture formation equipment which is conventional color electrophotography equipment constituted as mentioned above.

[0016] First, after printing several many sheets under a high-humidity/temperature environment, electrification of a toner became unstable, and the inclination which concentration unevenness and fogging tend to generate was suited.

[0017] Moreover, in monochrome continuation printing, the remaining printing was performed, after being in the middle of printing, once stopping printing operation and rotating a process unit for supply of a toner, when it becomes more than predetermined number of sheets, for this reason -- the case where the time which an actual picture output takes is long, and monochrome printing is performed especially continuously intermittently -- few, in spite of the

output of several sheets, it is in the middle of printing, and that a process unit rotates had occurred. And unsteady operation in the middle of such printing had given stress to those who wait for an output.

[0018] this invention is made in order to solve the aforementioned technical problem in the conventional technology, and it aims at offering the process unit used for the outstanding color picture formation equipment and this outstanding which neither concentration unevenness nor fogging generates after several multi-sheet printing under a high-humidity/temperature environment.

[0019] Moreover, this invention aims at offering the outstanding color picture formation equipment which can output a picture in a short time in monochrome continuation printing, without starting the short supply of a toner.

[0020]

[Means for Solving the Problem] In order to attain the aforementioned purpose, the 1st composition of the color picture formation equipment concerning this invention. Two or more process units which contain the toner of a color with which each differs, and have a photo conductor and a development means at least, and were arranged in a circle as a whole. A move means to rotate two or more aforementioned process units in one, and to move each process unit to a predetermined image formation position one by one. The toner hopper with which it has a synthetic means to compound a color image for the toner image of a color which is different on the aforementioned photo conductor in the aforementioned image formation position in piles, and the aforementioned development means accumulates a toner. The toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating. It is color picture formation equipment which has at least a toner supply means to supply a toner to the aforementioned toner support. The aforementioned development means is characterized by equipping the toner feed zone which it is near the contiguity section of the aforementioned toner support, and the aforementioned toner supply means further with a toner maintenance means to always hold the toner of the specified quantity. It can always hold to a toner feed zone, without returning the toner near the toner supply means charged comparatively to the toner receipt room of a toner hopper in rotation operation of a process unit according to the 1st composition of this color picture formation equipment. Therefore, also in a high-humidity/temperature environment, electrification of a toner is stabilized after several multi-sheet printing, and beautiful pictures which are not generated, such as concentration unevenness and fogging, are acquired.

[0021] Moreover, the 2nd composition of the color picture formation equipment concerning this invention. Two or more process units which contain the toner of a color with which each differs, and have a photo conductor and a development means at least, and were arranged in a circle as a whole. A move means to rotate two or more aforementioned process units in one, and to move each process unit to a predetermined image formation position one by one. The toner hopper with which it has a synthetic means to compound a color image for the toner image of a color which is different on the aforementioned photo conductor in the aforementioned image formation position in piles, and the aforementioned development means accumulates a toner. The toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating. It is color picture formation equipment which has at least a toner supply means to supply a toner to the aforementioned toner support. So that the toner of the toner feed zone which it is near the contiguity section of the aforementioned toner support and the aforementioned supply means may not return during rotation operation of the aforementioned process unit by the aforementioned move means at the aforementioned toner hopper. It is characterized by intercepting a part of opening which leads to the toner receipt room of the aforementioned toner hopper from the aforementioned toner feed zone. It can always hold to a toner feed zone, without returning the toner near the toner supply means comparatively charged in rotation operation of a process unit by easy composition to the toner receipt room of a toner hopper according to the 2nd composition of this color picture formation equipment.

[0022] Moreover, in the 2nd composition of the color picture formation equipment of the aforementioned this invention, it is desirable that the toner maintenance wall is prepared in the

aforementioned toner hold wall so that a toner feed zone may be formed with the outer wall section and the toner hold wall of a toner hopper and a part of opening which leads to the toner receipt room of the aforementioned toner hopper from the aforementioned toner feed zone may be intercepted.

[0023] Moreover, the 3rd composition of the color picture formation equipment concerning this invention. Two or more process units which contain the toner of a color with which each differs, and have a photo conductor and a development means at least, and were arranged in a circle as a whole. A move means to rotate two or more aforementioned process units in one, and to move each process unit to a predetermined image formation position one by one. The toner hopper with which it has a synthetic means to compound a color image for the toner image of a color which is different on the aforementioned photo conductor in the aforementioned image formation position in piles, and the aforementioned development means accumulates a toner. The toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating. [When it has further an accumulation means to be color picture formation equipment which has at least a toner supply means to supply a toner to the aforementioned toner support, and to accumulate the printing number of sheets of a monochrome image and carries out continuation formation of the monochrome image.] When the accumulation number of sheets of the aforementioned accumulation means comes during printing more than the predetermined number of sheets A, it is characterized by carrying out predetermined angle rotation of the aforementioned process unit from after a printing end before the next printing start, according to the 3rd composition of this color picture formation equipment. — monochrome continuation printing — setting — few — it is in the middle of printing of several sheets, and without interrupting printing, the amount of toners of the toner supply means circumference can be maintained appropriately, and poor supply of a toner can be prevented [0024] Moreover, in the 3rd composition of the color picture formation equipment of the aforementioned this invention, when the accumulation number of sheets of an accumulation means turns into the predetermined number of sheets B (B/A) during printing, once carrying out predetermined angle rotation of the process unit further, it is desirable that it is made to perform the remaining printing, according to this desirable example. — many — since the amount of toners of the toner supply means circumference is appropriately maintainable even if it is the case where continuation printing of several sheets is performed, poor supply of a toner can be prevented. Moreover, it is desirable to reset the accumulation number of sheets of an accumulation means at the same time it carries out predetermined angle rotation of the process unit in this case. According to this desirable example, the reduction situation of the toner newly supplied around the toner supply means by rotation of a process unit can be supervised by the accumulation number of sheets of the reset accumulation means. Moreover, it is desirable to enable it to set up the value of A or B freely in this case.

[0025] Moreover, the 1st composition of the process unit concerning this invention. The toner hopper with which it has a photo conductor and a development means at least, and is equipped possible [a rotation] in color picture formation equipment, and the aforementioned development means accumulates a toner while containing a toner. The toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating. It is the process unit which has at least a toner supply means to supply a toner to the aforementioned toner support. The aforementioned development means is characterized by equipping the toner feed zone which it is near the contiguity section of the aforementioned toner support, and the aforementioned toner supply means further with a toner maintenance means to always hold the toner of the specified quantity.

[0026] Moreover, the 2nd composition of the process unit concerning this invention. The toner hopper with which it has a photo conductor and a development means at least, and is equipped possible [a rotation] in color picture formation equipment, and the aforementioned development means accumulates a toner while containing a toner. The toner support which moves the toner to the aforementioned photo conductor while supporting a toner and rotating. It is the process unit which has at least a toner supply means to supply a toner to the aforementioned toner support, rotational motion — it is characterized by intercepting a part of opening which leads to

the toner receipt room of the aforementioned toner hopper from the aforementioned toner feed zone so that the toner of the toner feed zone which is near the proximity section of the aforementioned toner support and the aforementioned supply means may not return to the aforementioned toner hopper in appearance in the work.

[0027] Moreover, in the 2nd composition of the process unit of the aforementioned this invention, it is desirable that the toner maintenance wall is prepared in the aforementioned toner hold wall so that a toner feed zone may be formed with the outer wall section and the toner hold wall of a toner hopper and a part of opening which leads to the toner receipt room of the aforementioned toner hopper from the aforementioned toner feed zone may be intercepted.

[0028]

[Embodiments of the Invention] Hereafter, this invention is explained still more concretely using the gestalt of operation.

[0029] Drawing 1 is the sectional side elevation showing the whole color electrophotography equipment composition as color picture formation equipment in the gestalt of 1 operation of this invention.

[0030] As shown in [color electrophotography equipment whole composition] drawing 1, mostly, 4 sets of process-unit 1Bk(s) of this color electrophotography equipment whose cross sections for each colors of black, yellow, a Magenta, and cyanogen are sector image formation units in a center, and 1Y, 1M and 1C are arranged, and the process-unit group is constituted by these process-unit 1Bk(s), and 1Y, 1M and 1C. Two or more process-unit 1Bk(s), and 1Y, 1M and 1C are arranged in a circle, and they are constituted so that it may rotate in one. Since process-unit 1Bk for each colors, and 1Y, 1M and 1C are constituted using the same composition member, they have reliable composition to the alignment at the time of equipment assembly etc. [0031] Process-unit 1Bk arranged in a circle, and 1Y, 1M and 1C are supported by the base material (not shown), and can be rotated in the direction of arrow J around the cylinder-like shaft 32 by the move motor 31 which is a move means as a whole, each -- process-unit 1Bk, and 1Y, 1M and 1C move to the image formation position 50 which is a position which countered some middle imprint belts 42 \*\*\* (ed) one by one by the rollers 43, 44, and 45 which a photo conductor 2 mentions later, and are positioned This image formation position 50 is also an exposure position where the signal light 5 by which incidence was carried out exposes a photo conductor 2.

[0032] The laser aligner 33 generates the signal light 5 which is the laser beam modulated by the signal inputted into the printer section. In the state which showed in drawing 1, this signal light 5 passes the optical path formed between process-unit 1Y for process-unit 1Bk(s) and the yellow for blacks, and it carries out incidence to the polarizing lens 34 and mirror 35 which were fixed to the interior of a shaft 32 through the transparent aperture by which opening was carried out to some shafts 32. The signal light 5 which the direction was changed and was reflected by only 30 degrees of mirrors 35 is irradiated by the photo conductor 2 of process-unit 1Bk for blacks which is in the image formation position 50 through the aperture formed in the shaft 32. Thereby, a latent image is formed in the photo conductor 2 of process-unit 1Bk.

[0033] As shown in drawing 1, since the optical path from the laser aligner 33 to a mirror 35 is not what was formed along the space between the wall surfaces of process-unit 1Bk which carries out neighbors, and 1Y, and was formed specially, it has the composition that there is almost no unnecessary space in the occupancy space as a process-unit group. Moreover, since the polarizing lens 34 and the mirror 35 are formed in the space within the shaft 32 located in a part for the center section of a process-unit group, they do not interfere with the process-unit group which the polarizing lens 34 and mirror 35 which were fixed rotate, and its whole equipment composition is simple.

[0034] In the color electrophotography equipment of the gestalt of this operation, a synthetic means to compound a color image for the toner image of each color in piles is constituted considering the middle imprint belt 42 as a center. The middle imprint belt 42 is constituted by the resin film which made the base material the polycarbonate of half-conductivity (inside resistance) of the shape of an endless belt whose thickness is 100 micrometers. This middle imprint belt 42 is \*\*\* (ed) by the rollers 43, 44, and 45 made from stainless steel, and is movable

in the direction of arrow K of drawing 1.

[0035] In the gestalt of this operation, the circumference of the middle imprint belt 42 is set up for a long time a little rather than the length (about 297mm) of the longitudinal direction of the form of A4 size, and rollers 43, 44, and 45 are arranged so that the middle imprint belt 42 may be \*\*\* (ed). As shown in drawing 1, the pressure welding of the portion located between a roller 43 and a roller 44 among the middle imprint belts 42 is lightly carried out to the photo conductor 2, and [0036] In the state which shows in drawing 1, the voltage of +1kV is impressed to a roller 43 and a roller 44, and, thereby, the 1st imprint is performed to the middle imprint belt 42 from a photo conductor 2. The roller 45 in contact with the middle imprint belt 42 is grounded electrically. The 2nd imprint roller 46 is arranged so that a roller 45 may be countered through the middle imprint belt 42. This 2nd imprint roller 46 is constituted by the urethane foam by which low resistance processing was performed to the front face, and follower rotation is possible for it to the middle imprint belt 42. The bearing maintenance mechanism of the 2nd imprint roller 46 is constituted so that it may be arranged at two states, the state where the pressure welding of the follower rotation was lightly made possible to the middle imprint belt 42, and the state where separated and the middle imprint belt 42 was shunted. The state where it shunted in the position where the 2nd imprint roller 46 separated from the middle imprint belt 42 is shown in drawing 1. It enables it to impress the voltage of abbreviation +700V to the shaft of this 2nd imprint roller 46.

[0037] The form conveyance way is formed in the nip section in which the middle imprint belt 42 and the 2nd imprint roller 46 carry out a pressure welding so that a form may be sent from the feed section 47.

[0038] Near the middle imprint belt 42, the belt-cleaner section 48 equipped with the cleaner brush 49 for cleaning the middle imprint belt 42 is formed. The cleaner brush 49 is constituted so that it may be arranged at two states in the state where it estranged with the state where the pressure welding was carried out to the middle imprint belt 42.

[0039] The fixing assembly 51 is arranged at the downstream of the form sent from the nip section of the middle imprint belt 42 and the 2nd imprint roller 46, and this fixing assembly 51 is fixed to the toner image on the form after an imprint.

[0040] [Composition of process unit] drawing 2 is the cross section showing process-unit 1Bk for the blacks in the gestalt of 1 operation of this invention. Since it is constituted by the same member except for the toner contained by each, in order to simplify explanation, process-unit 1Bk for each colors in the gestalt of this operation, and 1Y, 1M and 1C explain only process-unit 1Bk for blacks, and omit the explanation about other process units 1Y, 1M, and 1C. In addition, in process-unit 1Bk for each colors, and 1Y, 1M and 1C, when it is necessary to give the same sign to the same portion and distinction of the composition of each color needs to be attached, the characters Bk (black), Y (yellow), M (Magenta), and C (cyanogen) which show each color will be given to a sign.

[0041] As shown in drawing 2, in process-unit 1Bk, the cleaner section 19 is formed in the development section 30 and the bottom at the bottom.

[0042] Although the development section 30 in the gestalt of this operation is the composition using the nonmagnetic 1 component developing-negatives method for developing negatives by making a photo conductor 2 carry out opposite contact of the elastic roller (developing roller 12) which is a toner support, it is a method of developing a xerography using the same composition, the composition of this invention can be used for it. For example, when using the same composition as the gestalt of this operation in the magnetic brush developing-negatives method, the jumping developing-negatives method, etc., the composition of this invention can be applied.

[0043] As shown in drawing 2, in the toner hopper 7 of the development section 30, black toner 7Bk of nonmagnetic 1 component of the minus electrification nature which distributed black colors to the binder which made polyester resin the base material is contained. The photo conductor 2 arranged between the development section 30 and the cleaner section 19 is an organic photo conductor, it uses a phthalocyanine for sensitive material and the polycarbonate system binder resin is constituted as a subject. The corona-electrical-charging machine 3 is arranged near the photo conductor 2, and, thereby, the photo conductor 2 is charged in minus.

The grid electrode 4 is formed in the corona-electrical-charging machine 3 so that it may counter with a photo conductor 2, and the electrification potential of a photo conductor 2 is controlled by this grid electrode 4.

[0044] In drawing 2, the dashed line shows the laser beam which is the signal light 5. This laser beam advances into process-unit 1Bk from the exposure aperture 6 which is opening of process-unit 1Bk, and irradiates a photo conductor 2.

[0045] The front face is constituted by the silicone rubber which has elasticity, and the developing roller 12 arranged so that it may be lightly pressed by the photo conductor 2 is functioning as a toner support. A doctor blade 13 is a layer regulation means for regulating the amount of black toner 7Bk on a developing roller 12, and forming a thin layer. Polyurethane rubber with a thickness of 2mm is really cast at the nose of cam of a stainless steel board with a thickness of 0.15mm which has elasticity, and this doctor blade 13 is being fixed to the blade mount 17 by the screw stop.

[0046] The pressure welding of the feed roller 14 is lightly carried out to the developing roller 12, and the urethane foam is formed in the front face of a feed roller 14. This feed roller 14 functions on a developing roller 12 as a supply means to supply black toner 7Bk, from the toner hold room 10 mentioned later.

[0047] The toner hold room 10 for suspending black toner 7Bk near the feed roller 14 temporarily is formed in the development section 30. As shown in drawing 2, the toner hold room 10 is formed with outer wall section 7a of the toner hopper 7, and the toner hold wall 15, and opening 10a which leads to the toner receipt room of the toner hopper 7 is prepared in this toner hold room 10. Moreover, the toner maintenance wall 16 is formed in the toner hold wall 15 so that a part of opening 10a may be intercepted. As shown in drawing 2, the toner maintenance wall 16 is arranged among black toner 7Bk(s) of the toner hold room 10 so that black toner 7Bk of the feed zone S which it is near the contiguity section of a feed roller 14 and a developing roller 12 may be enclosed.

[0048] As mentioned above, since the toner maintenance wall 16 is formed in process-unit 1Bk of the gestalt of this operation, even if it is a time of not only when process-unit 1Bk being arranged in the posture position (image formation position) shown in drawing 2, but process-unit 1Bk being arranged by rotation at other postures, black toner 7Bk of a feed zone S will always be held.

[0049] The cleaner section 19 for cleaning black toner 7Bk which remained in the front face of the photo conductor 2 after an imprint is formed in the photo conductor 2 bottom of process-unit 1Bk in the image formation position shown in drawing 2. The cleaning blade 20 for failing to scratch black toner 7Bk on a photo conductor 2 is formed in the interior of the cleaner section 19.

[0050] In the gestalt of this operation, the diameter is 30mm and the photo conductor 2 is carried out as [ rotate / in the direction of arrow E / by peripheral-speed 100 mm/s ]. Moreover, the diameter is 18mm and the developing roller 12 is carried out as [ rotate / in the direction of arrow F / with the peripheral speed of 160 mm/s ]. Furthermore, the diameter is 13mm and the feed roller 14 is carried out as [ rotate / in the direction of arrow G / by peripheral-speed 75 mm/s ].

[0051] As drawing 2 shows the posture of process-unit 1Bk for blacks in an image formation position and shows it to drawing 2, the toner hopper 7 with which black toner 7Bk was contained is arranged at the photo conductor 2 bottom in the perpendicular direction, and the cleaner section 19 is arranged at the photo conductor 2 bottom in the perpendicular direction. [0052] In the cleaner section 19, black toner 7Bk it was failed to scratch a cleaning blade 20 is fallen and suspended for the pars basilaris oissis occipitalis of the cleaner section 19 with the self-weight.

[0053] As mentioned above, if process-unit 1Bk of the gestalt of this operation is used While being able to hold black toner 7Bk enough near the feed roller 14 in the posture state of an image formation position, without preparing the delivery mechanism and agitator style for moving black toner 7Bk to the interior of the toner hopper 7 It can prevent that black toner 7Bk of the feed zone S charged comparatively is returned to the toner receipt room of the toner hopper 7

by rotation of process-unit 1Bk.

[0054] Since other process units 1Y, 1M, and 1C have the same composition, the same operation effect will be done so.

[0055] [Operation of a process unit], next concrete operation of the process unit of the gestalt of this operation constituted as mentioned above are explained.

[0056] First, a photo conductor 2 is rotated, the voltage of -5.5kV of corona-electrical-charging machines is impressed [ 3 ], and the front face of a photo conductor 2 is electrified. At this time, the applied voltage of a grid 4 is set as -500V, and the electrification potential of a photo conductor 2 is converged on -500V which are a fixed value.

[0057] Next, the signal light (laser beam) 5 is irradiated at the photo conductor 2 electrified as mentioned above, and an electrostatic latent image is formed. The exposure potential of the photo conductor at this time is -50V.

[0058] On the other hand, when a feed roller 14 and a developing roller 12 rotate in the development section 30, it is rubbed against the front face of a developing roller 12 while black toner 7Bk in the toner hold room 10 is charged in part by operation of a feed roller 14. It is made for a feed roller 14 and a developing roller 12 to serve as this potential electrically at this time.

[0059] Timing is doubled with the portion by which electrification in the front face of a photo conductor 2 was started coming to a developing roller 12 and the position where it counters, and the direct current voltage of -150V is impressed to a developing roller 12. On a photo conductor 2, the laser beam which is the signal light 5 is irradiated, and the toner image which carried out negative positive reversal is formed only at the picture section on the photo conductor 2 by which the pressure welding was carried out to the developing roller 12.

[0060] In drawing 2, black toner 7Bk which was not developed adhered to the developing roller 12 rotated in the direction of arrow F returns to an opposite portion with a feed roller 14, a part of this black toner 7Bk is scratched by the feed roller 14, and it is returned in the toner hold room 10, for this reason, a toner hold room -- black toner 7Bk charged comparatively will be accumulated in 10 especially at the feed zone S

[0061] Of the above image formation operation, the toner image of black is formed on a photo conductor 2. Same image formation operation is performed also in other process units 1Y, 1M, and 1C.

[0062] [Color image formation operation of color electrophotography equipment], next operation at the time of the color image formation in the color electrophotography equipment of the form of this operation are explained.

[0063] the initial state of the color electrophotography equipment of the gestalt of this operation -- setting -- each -- process-unit 1Bk, and 1Y, 1M and 1C are arranged in the position as shown in drawing 1. That is, process-unit 1Bk for blacks is arranged in the image formation position 50, and is in the state where the photo conductor 2 of process-unit 1Bk countered

some middle imprint belts 42. In this state, incidence of the laser beam which is the signal light 5 for blacks is carried out into process-unit 1Bk from the laser aligner 33, and image formation by black toner 7Bk is performed to the middle imprint belt 42 by the photo conductor 2. In this case, when the black toner image is imprinted by the middle imprint belt 42 from the photo conductor 2 by operation of the voltage impressed to rollers 43 and 44, image formation to the middle imprint belt 42 is performed. Here, the speed of the middle imprint belt 42 is set up so that it may become almost the same as that of the speed (equal to the peripheral speed of a photo conductor 2) of the image formation of process-unit 1Bk.

[0064] Immediately after all the toner images of black were imprinted by the middle imprint belt 42, process-unit group 1Bk, and 1Y, 1M and 1C are driven on the move motor 31, and rotate in the direction of arrow J of drawing 1 in one. Process-unit group 1Bk, and 1Y, 1M and 1C stop, when 90 degrees rotates and process-unit 1Y arrives at the image formation position 50, and positioning of process-unit 1Y is performed.

[0065] Process-unit 1Y arrives at the image formation position 50, and as mentioned above, after being positioned, like process-unit 1Bk for the above-mentioned blacks, incidence of the laser beam modulated by the signal for yellow is carried out into process-unit 1Y, and the toner image of yellow is formed on a photo conductor, and is imprinted by the middle imprint belt 42.



At this time, the middle imprint belt 42 is moving by one revolution, and the toner image of yellow is imprinted on the toner image of the black imprinted before. Here, the timing of the writing of the laser beam which is the signal light for yellow is controlled so that the toner image of black and the toner image of yellow agree in position.

[0066] Image formation operation of the above yellow and same operation are performed one by one also about a Magenta and cyanogen, and on the middle imprint belt 42, the toner image of four colors agrees in position, and it piles up. Thereby, a color image is formed. In addition, while the color image is formed on the middle imprint belt 42 in this way, the 2nd imprint roller 46 and the cleaner brush 49 are estranged in the position which separated a few from the middle imprint belt 42 so that the toner image on the middle imprint belt 42 might not be disturbed, as shown in drawing 1.

[0067] After the toner image of the last cyanogen is imprinted by the middle imprint belt 42, the middle imprint belt 42 continues moving at a speed as it is. The color image formed by the toner of four colors on the middle imprint belt 42 is imprinted by the form which doubles the color image and timing and is sent from the feed section 47. That is, according to the timing of the form sent from the feed section 47, the 2nd imprint roller 46 carries out the pressure welding of the form to the middle imprint belt 42, and thereby, the color image on the middle imprint belt 42 bundles up in a form, and is imprinted. And a fixing assembly 51 is fixed to the color image imprinted by the form. The form with which it was fixed to the color image is discharged out of equipment through the discharge roller 52.

[0068] The toner of the imprint remainder which remained on the middle imprint belt 42 is cleaned by the cleaner brush 49 which moved according to the timing after an imprint operation end. The cleaner brush 49 will be in the state where the pressure welding was carried out to the middle imprint belt 42 after the imprint operation end. Thus, in the form of this operation, with the cleaner brush 49, the middle imprint belt 42 is cleaned and it prepares for the next image formation operation.

[0069] In the color electrophotography equipment of [an operation of a toner maintenance wall], next the gestalt of this operation constituted as mentioned above, an operation of the toner maintenance wall 16 by a process-unit group rotating in the direction (drawing 1) of arrow J etc. is explained using drawing 3. Drawing 3 is a cross section for explaining operation of the process unit in the color electrophotography equipment of the gestalt of this operation.

[0070] Drawing 3 (1) shows the posture in case a process unit is in the image formation position 50. As shown in drawing 3 (1), the toner exists in each interior of the toner receipt room of the toner hopper 7, the toner hold room 10, and the cleaner section 19.

[0071] When a process-unit group rotates in the direction of arrow J of drawing 1 as mentioned above, the posture of a process unit changes to the state which shows in (2) of drawing 3, (3), and (4) one by one. It changes to the state where the self-weight also shows a toner to (2) of drawing 3, (3), and (4) with posture change of such a process unit.

[0072] The toner suspended in the toner hold room 10 in the state of the image formation position 50 shown in drawing 3 (1) moves from the state shown in drawing 3 (2) to the state which shows in drawing 3 (3). Thus, although it follows on moving from the state shown in drawing 3 (2) to the state which shows in drawing 3 (3) and a part of toner in the toner hold room 10 is once returned to the toner receipt room in the toner hopper 7, the toner of a feed zone S becomes [being held with as at a feed zone S, and] by operation of the toner maintenance wall 16.

[0073] When a process-unit group furthermore rotates, as shown in drawing 3 (4), a part of toner of the toner receipt room in the toner hopper 7 enters the toner hold room 10 again. And when a process unit returns to the image formation position 50, the inside of the toner hold room 10 is filled with the toner of the proper amount shown in drawing 3 (1).

[0074] As mentioned above, while the toner with which the feed zone S was charged comparatively had been held for every one revolution of a process-unit group in the place, once other toners in the toner hold room 10 are returned to the toner receipt room in the toner hopper 7, some toners of the toner receipt room in the toner hopper 7 newly enter the toner hold room 10 again, and the toner hold room 10 is filled with a toner.

[0075] As mentioned above, by establishing the toner maintenance wall 16 so that according to the color electrophotography equipment of the gestalt of this operation the toner hold room 10 may be established in a process unit and the toner of a feed zone S may be enclosed it can hold to a feed zone S, without returning the toner of a feed zone S charged comparatively during the rotation of a process unit at the toner receipt room in the toner hopper 7, permitting movement of the toner between the toner hold room 10 and the toner receipt room in the toner hopper 7. Therefore, also in a high-humidity/temperature environment, electrification of a toner is stabilized after several multi-sheet printing, and beautiful pictures which are not generated, such as concentration unevenness and fogging, are acquired.

[0076] [Map operation at the time of monochrome mode], next map operation at the time of the monochrome mode in the color electrophotography equipment of the form of this operation are explained using drawing 1.

[0077] On the occasion of map operation at the time of monochrome mode, first, a process-unit group is rotated, it is made to move to the image formation position 50, and the process unit of a desired color is positioned. And like the case of the above-mentioned color map operation, the toner image of a desired color is formed in a photo conductor 2, and the imprint to the middle imprint belt 42 is performed. In map operation at the time of monochrome mode, the middle imprint belt 42 moves continuously as it is after an imprint, and is imprinted by the form with which the toner image on the middle imprint belt 42 is sent by press operation of the 2nd imprint roller 46 from the feed section 47. At this time, the 2nd imprint roller 46 will be in the state where the pressure welding was carried out to the middle imprint belt 42, according to the timing which the nose of cam of the toner image on the middle imprint belt 42 approaches.

[0078] In the color electrophotography equipment of the form of [intermittent map operation at the time of monochrome mode], next this implementation, operation in the case of outputting four pictures of black at a time intermittently is explained using drawing 1 and drawing 4.

[0079] In this case, the 2nd imprint roller 46 and the cleaner brush 49 are maintained in the state [that a pressure welding is carried out to the middle imprint belt 42, respectively].

[0080] First, it is judged whether it is image formation operation in monochrome mode (S1 of drawing 4), and in not being image formation operation in monochrome mode, the value of the counter (not shown) which is an accumulation means is reset, and it makes it "0" (S2 of drawing 4). On the other hand, when it is judged that image formation operation in monochrome mode is performed next, it is judged whether the process unit for printing colors is in the image formation position 50 (S3 of drawing 4), and -- the case where there is no process unit for printing colors in the image formation position 50 -- the value of a counter -- resetting -- "0" -- carrying out (S4 of drawing 4) -- a process-unit group is rotated and the process unit for printing colors is positioned in the image formation position 50. On the other hand, when the process unit for printing colors is in the image formation position 50, printing is started as it is. It is in the image formation position 50, for example, process-unit 1Bk for blacks forms the toner image after the 2nd sheet continuously in the position as it is, after ending the image formation of the toner image of the 1st sheet. That is, the toner image after the 2nd sheet is imprinted after the middle imprint belt 42 top after the toner image of the 1st sheet was cleaned by the cleaner brush 49. [0081] Thus, to the 4th sheet, a picture is outputted and it stops. In addition, monochromatic output number of sheets is accumulated by the counter at this time. Supposing the initial value of the counter before printing is "0", the value of the counter in this case will be set to "4". [0082] Then, printing of every four sheets is performed 7 times intermittently. Operation to the 28th total is the same as the above-mentioned thing. In addition, the value of the counter after printing is "28."

[0083] In this state, as shown in drawing 2, the amount of collected on the toner hold room 10 in the process-unit 1 development section 30 of Bk black toner 7Bk has decreased by the image formation of 28 sheets.

[0084] Furthermore it continues and printing of four sheets is performed. After ending printing of four sheets by the operation same at this time as the above-mentioned thing, 360 degrees of process-unit groups are rotated in the direction of arrow J of drawing 1, and once again, process-unit 1Bk for blacks is positioned in the image formation position 50, and it ends.



Simultaneously, the value of a counter is reset and it is made "0." For this reason, it will be in the state where many new toners were accumulated at the toner hold room 10.

[0085] In addition, the value of a counter is reset, when monochrome printing of other colors was performed between monochrome printing, or when printing of two or more colors is performed and a process-unit group rotates.

[0086] Although the case where monochrome printing of every four sheets was performed above continuously intermittently was mentioned as the example and explained, it is not related to number of sheets. Moreover, when the accumulation value of a counter exceeds "30", after interrupting printing at the time, not rotating a process-unit group and the accumulation value of a counter ending printing first exceeding "30", a process-unit group is rotated, thus, the thing to do -- few -- it is in the middle of printing of several sheets, and without interrupting printing, the amount of toners in the hold room 10 can be maintained appropriately, and poor supply can be prevented.

[0087] Moreover, it is judged whether the accumulation value of a counter reached during printing operation at the predetermined value B (here, the predetermined value B is set as "50") (S5 of drawing 4), and by the time the accumulation value of a counter exceeds "30" and the accumulation value of a counter is further set to "50", in not ending printing. When the accumulation value of a counter exceeds "50", even if it is in the middle of printing, printing operation is once stopped (S6 of drawing 4). The remaining printing is performed, after resetting the value of a counter and making it "0" (S8 of drawing 4), while rotating a process-unit group (S7 of drawing 4) and positioning process-unit 1Bk for blacks in the image formation position 50 once again (S9 of drawing 4). For example, when the accumulation value of a counter was "28", 30-sheet continuation printing was carried out continuously, 22 sheets were printed and the accumulation value of a counter was set to "50", after once stopping printing operation and rotating a process-unit group, the eight remaining sheets are printed, thus, the thing to do -- many -- since the amount of toners in the hold room 10 is appropriately maintainable even if it is the case where continuation printing of several sheets is performed, poor supply of a toner can be prevented. In addition, during printing operation, when the accumulation value of a counter does not reach the predetermined value B, printing operation is performed continuously.

[0088] Next, when it is judged whether printing is ended or not (S10 of drawing 4) and it ends printing, it is judged whether the accumulation value of a counter has turned into beyond the predetermined value A (here, the predetermined value A is set as "30") at the time (S11 of drawing 4). Printing is ended, after resetting the value of a counter and making it "0" (S13 of drawing 4), while rotating a process-unit group (S12 of drawing 4), when the accumulation value of a counter is judged to be more than "30". On the other hand, when the accumulation value of a counter is judged not to fulfill "30", printing is ended as it is.

[0089] As mentioned above, after the whole of the printing is completed, a process-unit group is made to once turn, when the accumulation number of sheets in monochrome mode is accumulated to a counter and the accumulation value of a counter exceeds the predetermined value A. Moreover, the remaining printing is performed, after once stopping printing operation at the time and carrying out one revolution of process-unit groups, when the accumulation value of a counter turns into the predetermined value B (>A) before the end of the printing, thus, the thing to do -- monochrome mode -- setting -- few -- are in the middle of printing of several sheets, and printing is interrupted -- there is nothing -- moreover -- many -- when printing several sheets continuously intermittently, the toner of an amount always suitable in the toner hold room 10 is suspended, and with a bird clapper, there is nothing to the short supply of a toner. Moreover, it becomes possible to suppress rotation operation of a process-unit group to the minimum.

[0090] In addition, it enables it to be suitably changed by the user side about the value of the set points A and B (>A). For example, in outputting many pictures with few black fields, such as a character picture, it sets it as A= 60 and B= 100, and when outputting many pictures with many [conversely] black fields, such as a figure, it can be set as A= 30 and B= 50 as mentioned above. By doing in this way, according to an output picture, the amount of the toner in the toner hold room 10 can be maintained appropriately, and poor supply can be prevented by rotation

operation of a necessary minimum process cartridge group.

[0091] Moreover, in the above, although the case where a process cartridge group was rotated after a printing end was mentioned as the example and explained, even if it makes it rotate a process cartridge group before a printing start, the same effect can be acquired. Hereafter, this printing operation of a type "that rotates a process cartridge group before a printing start" is explained using drawing 1 and drawing 5.

[0092] First, it is judged whether it is image formation operation in monochrome mode (S21 of drawing 5), and in not being image formation operation in monochrome mode, the value of a counter is reset and it makes it "0" (S22 of drawing 5). On the other hand, when it is judged that image formation operation in monochrome mode is performed next, it is judged whether the process unit for printing colors is in the image formation position 50 (S23 of drawing 5). And when there is no process unit for printing colors in the image formation position 50, the value of a counter is reset and it is made "0" (S24 of drawing 5). On the other hand, when the process unit for printing colors is in the image formation position 50, it is judged whether the accumulation value of a counter has turned into beyond the predetermined value A (here, the predetermined value A is set as "30") at the time (S25 of drawing 5). Printing is started, after resetting the value of a counter and making it "0" (S27 of drawing 5), while rotating a process-unit group (S26 of drawing 5), when the accumulation value of a counter is judged to be more than "30". On the other hand, when the accumulation value of a counter does not fulfill "30", printing is started as it is.

[0093] Moreover, it is judged whether the accumulation value of a counter reached during printing operation at the predetermined value B (here, the predetermined value B is set as "50") (S28 of drawing 5), and by the time the accumulation value of a counter exceeds "30" and the accumulation value of a counter is further set to "50", in not ending printing. When the accumulation value of a counter exceeds "50", even if it is in the middle of printing, printing operation is once stopped (S29 of drawing 5). The remaining printing is performed, after resetting the value of a counter and making it "0" (S31 of drawing 5), while rotating a process-unit group (S30 of drawing 5) and positioning process-unit 1Bk for blacks in the image formation position 50 once again (S32 of drawing 5). In addition, during printing operation, when the accumulation value of a counter does not reach the predetermined value B, printing operation is performed continuously.

[0094] Next, in judging whether printing is ended or not (S33 of drawing 5) and ending printing, it ends printing as it is.

[0095] [A maintenance of color electrophotography equipment], next the maintenance in the color electrophotography equipment of the gestalt of this operation are explained using drawing 6. Drawing 6 is the cross section showing the state where opened the operation door and process-unit 1C for cyanogen was pulled out. Below, the maintenance in that case is explained supposing the case where the specific color, for example, the toner of cyanogen, is no longer consumed etc.

[0096] First, the move motor 31 rotates a process-unit group by the instructions (based on the switch which is not illustrated) from an operator. And the process unit which should be maintained is moved to an up position (position of process-unit 1C of drawing 1). Next, as shown in drawing 4, an operator opens the operation door 460 of the main part upper part of equipment wide, and takes out only the process unit which should be maintained out of equipment. Next, the same position is beforehand equipped with the corresponding adjusted new process unit for colors as a process unit. Thus, image formation can be continued similarly, without carrying out any adjustment after wearing of a new process unit, since the process unit of the same configuration was only exchanged.

[0097] In the color electrophotography equipment of the gestalt of this operation, since the process unit which should be exchanged is exchangeable in a different position from an image formation position, it is not interfered with it by related members, such as copy. Moreover, since the process unit in the state of being exchangeable is not positioned, it can be easily taken out of equipment. Therefore, the color electrophotography equipment of the gestalt of this operation is equipment excellent in maintenance nature.

[0098] In addition, in the form of the above-mentioned implementation, although a photo conductor, a development means, and the cleaner section mentioned as the example the color electrophotography equipment of composition of rotating the process unit incorporated in one and explained it, this invention is not necessarily applied only to the color electrophotography equipment of this composition. For example, it can have only a development means as a process unit, this invention can be applied to the color electrophotography equipment of a method rotated to the image formation position which counters one photo conductor which fixed this development means, and the same effect can be done so.

[0099]

[Effect of the Invention] As explained above, according to this invention, the outstanding color picture formation equipment and the outstanding process unit which have neither concentration unevenness nor fogging after several multi-sheet printing are realizable under a high-humidity/temperature environment with easy composition. Moreover, according to this invention, in monochrome continuation printing, there is no futility of picture output time and the outstanding color picture formation equipment which can suppress operation for toner supply to the minimum can be realized.

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The sectional side elevation showing the whole color electrophotography equipment composition as color picture formation equipment in the gestalt of 1 operation of this invention

[Drawing 2] The cross section showing the process unit for blacks in the gestalt of 1 operation of this invention

[Drawing 3] The cross section for explaining operation of the process unit in the color electrophotography equipment of the gestalt of 1 operation of this invention

[Drawing 4] The flow chart which shows intermittent map operation at the time of the monochrome mode of the color electrophotography equipment in the gestalt of 1 operation of this invention

[Drawing 5] The flow chart which shows other examples of intermittent map operation at the time of the monochrome mode of the color electrophotography equipment in the gestalt of 1 operation of this invention

[Drawing 6] The cross section for explaining operation at the time of the maintenance of the color electrophotography equipment of the gestalt of 1 operation of this invention

[Drawing 7] The sectional side elevation showing the whole color electrophotography equipment composition as color picture formation equipment in the conventional technology.

[Description of Notations]

1Bk Process unit for blacks

1Y The process unit for yellow

1M The process unit for Magentas

1C The process unit for cyanogen

2 Photo Conductor

10 Toner Hold Room

12 Developing Roller

13 Doctor Blade

14 Feed Roller

15 Toner Hold Wall

16 Toner Maintenance Wall

19 Cleaner Section

30 Development Section

33 Laser Aligner

42 Middle Imprint Belt

46 2nd Imprint Roller

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[Translation done.]



カラー複写機あるいはカラーファックス等に適用することのできるカラー電子写真装置であるカラー画像形成装置及びそれを用いるプロセユニットに関する。

[0002]

【従来の技術】電子写真によってカラー画像を形成するに際しては、イエロー、マゼンタ、シアン、ブラックの各色のトナー像を転写材上において重ね合わせカラー画像を形成する方法が一般に用いられている。このように各色のトナー像を重ね合わせてカラー画像を出力するカラー電子写真装置としては、現在までに各種の装置が提案されている。例えば、特開平7-36246号公報には、これまでない新規な構成のカラー電子写真装置が開示されている。以下、このカラー電子写真装置を置いて、図7を参照しながら説明する。図7は上記公報に開示されたカラー電子写真装置の全体構成を示す断面図である。

[0003] 図7に示すように、このカラー電子写真装置のほぼ中央には、ブラック、イエロー、マゼンタ、シアン、各色用の断面が扇形の像形成ユニットである4組のプロセスユニット101Bk、101Y、101M、101Cが配置されており、これらのプロセスユニット101Cは、101Bk、101Y、101M、101Cによってプロセユニット101Bk、101Y、101M、101Cは、円筒状に配置されている。各プロセスユニット101Bk、101Y、101M、101Cは、感光体と、それぞれのトナーを収納した現像器と、クリップとの3つを主要な構成部材を備えている。

[0004] 円筒状に配置されたプロセスユニット101Bk、101Y、101M、101Cは支持体（図示せず）に支持されており、円筒状の軸122の周りに矢印X方向に回転移動可能となっている。各プロセスユニット101Bk、101Y、101M、101Cは、感光体が中間転写ベルト132に矢印X方向に移動して位置決めされる。この像形成位置150は、信号光105が感光体を露光する露光位置でもある。

[0005] レーザ露光装置123は、プリンタ部に入力された信号によって変調されたレーザビームである信号光105を発生する。この信号光105は、図7に示した状態において、イエロー用のプロセスユニット101Yとマゼンタ用のプロセスユニット101Mとの間に形成された光路を通過し、軸122の一部に開口された透明の窓を通して軸122の内部に固定されたミラー124に反射する。ミラー124によって反射された信号光105は、像形成位置150にあるブラック用のプロセスユニット101Bkの感光体に照射される。これにより、プロセスユニット101Bkの感光体上に露光が形成される。

[0006] 中間転写ベルト132は、厚さが100μ

mのエンドレスベルト状の半導電性のウレタンを基材としたフィルムにより構成されている。この中間転写ベルト132は、転写ローラ133とステレンス製のローラ134に架張されて、矢印Y方向に移動可能となっている。転写ローラ133の外周には低抵抗処理が施されたウレタンフォームが形成されている。

[0007] 転写ローラ133は、中間転写ベルト132を介して像形成位置150にあるブラック用のプロセスユニット101Bkの感光体に軽く圧接されている。ローラ134の近側には第2転写ローラ135が設けられ、中間転写ベルト132に軽く圧接されている。

[0008] 中間転写ベルト132と第2転写ローラ135が圧接しているニップ部には、給紙部136から用紙が送られてくるように用紙搬送路が形成されている。[0009] 中間転写ベルト132と第2転写ローラ135とのニップ部から送られてくる用紙の下流側には定着器144が配置されており、この定着器144によって転写後の用紙上のトナー像が定着される。

[0010] 次に、上記従来のカラー電子写真装置におけるカラー像形成時の動作について説明する。

[0011] 初期状態において、各プロセスユニット101Bk、101Y、101M、101Cは、図5に示すような位置に配置されている。すなわち、ブラック用のプロセスユニット101Bkは像形成位置150に配置されており、プロセスユニット101Bkの感光体は、中間転写ベルト132の一部に矢印X方向に移動して位置決めされる。この状態にある。この状態において、レーザ露光装置123からブラック用の信号光105がプロセスユニット101Bkに照射され、感光体上にブラックトナーによる像形成が行われる。

[0012] 上記のように感光体上にブラックのトナー像が形成されるとき、中間転写ベルト132上にもブラックのトナー像が転写されていく。ブラックのトナー像がすべて中間転写ベルト132に転写された直後に、プロセスユニット101Cの感光体全体が一体的に図5の矢印X方向に90°回転移動する。そして、シアン用のプロセスユニット101Cの感光体が位置決めされる。

[0013] 上記のようにシアン用のプロセスユニット101Cが像形成位置150に位置決めされた後、前述のブラック用のプロセスユニット101Bkと同様に、シアン用の信号光105がプロセスユニット101Cに入射され、シアンのトナー像が感光体上に形成され、中間転写ベルト132に転写される。このようにシアンに転写されたブラックのトナー像がシアンのトナー像と、前に転写された位置となるよう、中間転写ベルト132は1回転して配置されるように制御されている。

[0014] 上記と同様の転写動作が次のマゼンタ、イ

常に所定量のトナーを保持するトナー保持手段を備えたことを特徴とする。このカラー画像形成装置の第1の構成によれば、プロセスユニットの回転動作において、比較的帯電したトナー供給手段近傍のトナーをトナーホッパーのトナー収納室に属することなく、トナー供給部に常に保持することができ、従って、高速度環境において、また、多数が印字後においても、トナーの帯電が安定し、濃度むらやカブリ等の発生しない美しい画像が得られる。

[0021] また、本発明に係るカラー画像形成装置の第2の構成は、各々が異なる色のトナーを収納し、かつ、少なくとも感光体と現像手段とを有し、全体として円筒状に配列された複数のプロセスユニットと、前記複数のプロセスユニットを一体的に回転させて、各々のプロセスユニットを順次所定の像形成位置に移動させる移動手段と、前記像形成位置において前記感光体上に異なる色のトナー像を重ねてカラー像を合成する合成手段とを備え、前記像形成手段がトナーを溜めるトナーホッパーと、トナーを保持して回転しながらそのトナーを前記感光体に移動させるトナー保持手段と、前記トナー保持手段にカラー画像形成装置であって、前記移動手段による前記プロセスユニットの回転動作中において前記トナー保持手段と前記供給手段との近接部近傍であるトナー供給部の一供給部から前記トナーホッパーに異なるように、前記トナー供給部が前記トナーホッパーのトナー収納室へ通じる開口部の一部が遮断されたことを特徴とする。このカラー画像形成装置の第2の構成によれば、簡単な構成によって、プロセスユニットの回転動作において、比較的帯電したトナー供給手段近傍のトナーをトナーホッパーのトナー収納室に戻すことなく、トナー供給部に常に保持することができる。

[0022] また、前記本発明のカラー画像形成装置の第2の構成においては、トナー供給部がトナーホッパーの外壁部とトナー保留室とにより形成され、前記トナー供給部から前記トナーホッパーのトナー収納室へ通じる開口部が遮断されるように、前記トナー保留室にトナー保持手段が設けられているのが好ましい。

[0023] また、本発明に係るカラー画像形成装置の第3の構成は、各々が異なる色のトナーを収納し、かつ、少なくとも感光体と現像手段とを有し、全体として円筒状に配列された複数のプロセスユニットと、前記複数のプロセスユニットを一体的に回転させて、各々のプロセスユニットを順次所定の像形成位置に移動させる移動手段と、前記像形成位置において前記感光体上に異なる色のトナー像を重ねてカラー像を合成する合成手段とを備え、前記像形成手段がトナーを溜めるトナーホッパーと、トナーを保持して回転しながらそのトナーを前記感光体に移動させるトナー保持手段と、前記トナー保持手段にカラー画像形成装置であって、前記移動手段と前記供給手段とを少なくともも有するトナー供給部近傍であるトナー供給部に

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カラー画像形成装置であって、単色像の印字装置を具備する累積手段とさらに備え、単色像を連続形成する場合に於いて、印字中に前記累積手段の累積枚数が所定枚数A以上になったときは、印字終了後から次の印字開始までの間に前記プロセスユニットを所定角度回転させるようにすることを特徴とする。このカラー画像形成装置の第3の構成によれば、単色連続印字において、少数枚の印字途中で印字を中断することなく、トナーの供給周辺のトナー量を適切に維持することができ、トナーの供給不良を防止することができる。

【0024】また、前記本発明のカラー画像形成装置の第3の構成においては、さらに、印字中に累積手段の累積枚数が所定枚数B (B>A) になったときは、プロセスユニットを一旦所定角度回転させた後、残りの印字を行うようにするのが好ましい。この好ましい例によれば、多数枚の連続印字を行う場合であっても、トナー供給手段周辺のトナー量を適切に維持することができ、トナー供給不良を防止することができる。

【0025】また、本発明に係るプロセスユニットの第1の構成は、トナーを収納すると共に、少なくとも感光体と現像手段とを有し、かつ、カラー画像形成装置内に回転移動可能な駆動部、前記現像手段がトナーを溜めるトナーホッパーと、トナーを保持して回転しながらそのトナーを前記感光体に移載させるトナー担持体と、前記トナー担持体にトナーを供給するトナー供給手段とを少なくとも有するプロセスユニットであって、前記現像手段がさらに前記トナー担持体に常所定量のトナーを近接部近傍であるトナー保持手段を備えたことを特徴とする。

【0026】また、本発明に係るプロセスユニットの第2の構成は、トナーを収納すると共に、少なくとも感光体と現像手段とを有し、かつ、カラー画像形成装置内に回転移動可能な駆動部、前記現像手段がトナーを溜めるトナーホッパーと、トナーを保持して回転しながらそのトナーを前記感光体に移載させるトナー担持体と、前記トナー担持体にトナーを供給するトナー供給手段とを少なくとも有するプロセスユニットであって、回転動作中において前記トナー担持体と前記供給手段との近接部近傍であるトナー保持手段が前記トナーホッパーに隣接しないように、前記トナー供給部から前記トナーホッパーのトナー収納室へ通じる開口部の一部が遮断されたことを特徴とする。

【0027】また、前記本発明のプロセスユニットの第2の構成においては、トナー供給部がトナーホッパーの外壁部とトナー保持壁により形成され、前記トナー供給部から前記トナーホッパーのトナー収納室へ通じる開口部の一部が遮断されるように、前記トナー保持壁にトナー保持壁が設けられているのが好ましい。

【0028】

【発明の実施の形態】 以下、実施の形態を用いて本発明をさらに具体的に説明する。

10 【0029】図1は本発明の一実施の形態におけるカラー画像形成装置としてのカラー電子写真装置の全体構成を示す側面図である。

【0030】【カラー電子写真装置の全体構成】 図1に示すように、このカラー電子写真装置のほぼ中央には、ブラック、イエロー、マゼンタ、シアンの各色用の断面が異なる像形成ユニットである4組のプロセスユニット1Bk、1Y、1M、1Cが配置されており、これらのプロセスユニット1Bk、1Y、1M、1Cによってプロセスユニット群が構成されている。複数のプロセスユニット1Bk、1Y、1M、1Cは、円周状に配置され、一体的に回転するように構成されている。各色用のプロセスユニット1Bk、1Y、1M、1Cは同一構成の部材を用いて構成されているため、装置組立時の位置合わせ等に対して信頼性の高い構成となっている。

【0031】円周状に配置されたプロセスユニット1Bk、1Y、1M、1Cは支持体 (図示せず) によって支持されており、全体として移動手段である移動モータ31によって円周状の軸32の周りに矢印J方向に回転移動可能となっている。各プロセスユニット1Bk、1Y、1M、1Cは、順次、感光体2が後述するローラ43、44、45に装填された中間転写ベルト42の一部に対向した位置である像形成位置50に移動して位置決めされる。この像形成位置50は、入射された信号光5が感光体2を露光する露光位置でもある。

【0032】レーザ露光装置33は、プリンタ部に入力された信号によって装填されたレーザビームである信号光5を発生する。この信号光5は、図1に示した状態において、ブラック用のプロセスユニット1Bkとイエロー用のプロセスユニット1Yとの間に形成された光路を通過し、軸32の一部に開口された透明窓を通過して軸32の内部に固定された偏光レンズ34及びミラー35に入射する。ミラー35によって30°だけ方向を変更されて反射された信号光5は、軸32に形成された窓を通過して像形成位置50にあるブラック用のプロセスユニット1Bkの感光体2に照射される。これにより、プロセスユニット1Bkの感光体2に潜像が形成される。

【0033】図1に示すように、レーザ露光装置33からミラー35までの光路は、同様のプロセスユニット1Bk、1Yの断面間の空間に沿って形成され、特別に形成されたものではないため、プロセスユニット群として

とのニップ部から送られてくる用紙の下流側には定着器51が配置されており、この定着器51によって転写後の用紙上のトナー像が定着される。

【0040】【プロセスユニットの構成】 図2は本発明の一実施の形態におけるブラック用のプロセスユニット1Bkを示す断面図である。本実施の形態における各色のプロセスユニット1Bk、1Y、1M、1Cは、それぞれに装填されるトナーを除いて同じ部材によって構成されているので、説明を簡略化するために、ブラック用のプロセスユニット1Bkについての説明、他のプロセスユニット1Y、1M、1Cについては同じ符号を付す。尚、各色用のプロセスユニット1Bk、1Y、1M、1Cにおいて、同じ部分には同じ符号を付し、各色の構成の区別を付ける必要がある場合には、符号に各色を示す文字Bk (ブラック)、Y (イエロー)、M (マゼンタ)、C (シアン) を付すことにする。

【0041】図2に示すように、プロセスユニット1Bkにおいて、上側には現像部30、下側にはクリーナ部19が設けられている。

【0042】本実施の形態における現像部30は、トナー担持体である弾性ローラ (現像ローラ12) を感光体2に対向接触させて現像を行う非磁性一成分現像法を用いた構成であるが、同様な構成を用いる電子写真法の現像法であれば、本発明の構成を用いることができる。例えば、磁気ブラシ現像法、ジャンピング現像法などにおいて本実施の形態と同様の構成を用いる場合には、本発明の構成を適用することができる。

【0043】図2に示すように、現像部30のトナーホッパー7内には、ポリエステル樹脂を基材としたバインダーに黒顔料を分散したマイナスイオン帯電性の非磁性成分を有するブラックトナー7Bkが収納されている。現像部30とクリーナ部19との間に配設された感光体2は有機感光体であり、フタロシアニンを感光材料に用い、ポリカーボネート系バインダー樹脂を主体として構成されている。感光体2の近傍にはコロナ帯電器3が配設されており、これにより感光体2がマイナスイオンに帯電されている。コロナ帯電器3には、感光体2と対向するようにグリッド電極4が設けられており、このグリッド電極4によって感光体2の帯電電位が制御されている。

【0044】図2において、1点鎖線は信号光5であるレーザビームを示している。このレーザビームは、プロセスユニット1Bkの開口部である露光窓6からプロセスユニット1Bk内に進入し、感光体2を照射する。

【0045】感光体2に強く押圧されるように配置された現像ローラ12は、その表面が弾性を有するシリコーンゴムによって構成されており、トナー担持体とし機能している。ドクターブレード113は、現像ローラ12上のブラックトナー7Bkの量を規制して溝壁を形成するための溝壁形成手段である。このドクターブレード113

の占有空間には不要な空間がほとんど無い構成となっている。また、露光レンズ34及びミラー35はプロセスユニット群の中央部分に位置する軸32内の空間に設けられているため、固定された露光レンズ34及びミラー35が回転移動するプロセスユニット群の邪魔をすることなく、かつ、装置の全体構成がシンプルとなっている。

【0034】本実施の形態のカラー電子写真装置において、各色のトナー像を重ねてカラー像を合成する合成手段は、中間転写ベルト42を中心として構成されている。中間転写ベルト42は、厚さが100μmのエンダレスベルト状の半導電性 (中抵抗) のポリカーボネートを基材とした樹脂フィルムにより構成されている。この中間転写ベルト42は、ステレンス製のローラ43、44、45に装填されて、図1の矢印K方向に移動可能となっている。

【0035】本実施の形態において、中間転写ベルト42の間隔は、A4サイズの用紙の長手方向の長さ (約297mm) よりも若干長く設定されており、ローラ43、44、45は中間転写ベルト42を張弛するよう配置されている。図1に示すように、中間転写ベルト42のうち、ローラ43とローラ44との間に位置する部分は、感光体2に強く圧接されている。

【0036】図1に示す状態において、ローラ43とローラ44には+1kVの電圧が印加され、これにより感光体2から中間転写ベルト42に第1転写が行われる。中間転写ベルト42と接触しているローラ45は、電気的に接地されている。第2転写ローラ46は、ローラ45に中間転写ベルト42を介して対向するように配置されている。この第2転写ローラ46は、表面に低抵抗処理が施されたウレタンフォームによって構成され、中間転写ベルト42に対して従動回転可能となっている。第2転写ローラ46の軸受け保持機構は、中間転写ベルト42に対して従動回転可能に強く圧接した状態と、中間転写ベルト42から離れて待機した状態の2つの状態に配置されるように構成されている。図1には、第2転写ローラ46が中間転写ベルト42から離れた位置に待機した状態が示されている。この第2転写ローラ46の軸に対しては約700Vの電圧を印加することができるようにされている。

【0037】中間転写ベルト42と第2転写ローラ46が圧接するニップ部には、総線部47から用紙が送られてくるように用紙搬送路が形成されている。

【0038】中間転写ベルト42の近傍には、中間転写ベルト42を清掃するためのクリーナブレード49を備えたベルトクリーナ部48が設けられている。クリーナブレード48は、中間転写ベルト42に対して圧接した状態と離隔した状態の2つの状態に配置されるように構成されている。

【0039】中間転写ベルト42と第2転写ローラ46

は、弾性を有する厚さ0.15mmのステンレス板の先端に厚さ2mmのウレタンゴムが一体成型されたものであり、ネジ止めによってプレート取付台17に固定されている。

[0046] 供給ローラ14は現像ローラ13に駆動圧接されており、供給ローラ14の表面にはワタシブームが形成されている。この供給ローラ14は、後述するトナー保留室10から現像ローラ12にブラックトナー7Bkを供給する供給手段として機能するものである。

[0047] 現像部30には、ブラックトナー7Bkを一時的に供給ローラ14の近傍に保留しておくためのトナー保留室10が形成されている。図2に示すように、トナー保留室10は、トナーホッパー7の外壁部7aとトナー保留壁15とにより形成されており、このトナー保留室10には、トナーホッパー7のトナー収容室に連通する開口部10aが設けられている。また、トナー保留壁15には、開口部10aの一部を遮断するように、トナー保持壁16が設けられている。図2に示すように、トナー保持壁16は、トナー保留室10のブラックトナー7Bkのうち、供給ローラ14と現像ローラ12との近接部近傍である供給部Sのブラックトナー7Bkを囲い込むように配置されている。

[0048] 以上のように、本実施の形態のプロセスユニット1Bにはトナー保持壁16が設けられているため、図2に示す姿勢位置（像形成位置）にプロセスユニット1Bが配置されているときの姿勢ならびに、プロセスユニット1Bが回転によって他の姿勢に配置されているときであっても、常に供給部Sのブラックトナー7Bkが保持されることとなる。

[0049] 図2に示す像形成位置にあるプロセスユニット1Bの感光体2の下側には、転写後の感光体2の表面に残ったブラックトナー7Bkを清掃するためのクリーナ部19が設けられている。クリーナ部19の内部には、感光体2上のブラックトナー7Bkを掻き落とすためのクリーニングブレード20が設けられている。

[0050] 本実施の形態において、感光体2は、その直径が30mmであり、周速100mm/sで矢印E方向に向いて回転するようにされている。また、現像ローラ12は、その直径が18mmであり、周速160mm/sで矢印F方向に回転するようにされている。さらに、供給ローラ14は、その直径が13mmであり、周速75mm/sで矢印G方向に回転するようにされている。

[0051] 図2は像形成位置にあるブラック用のプロセスユニット1Bの姿勢を示しており、図3に示すように、ブラックトナー7Bkが収容されたトナーホッパー7は給送方向における感光体2の上側に配置され、クリーナ部19は給送方向における感光体2の下面に配置されている。

[0052] クリーナ部19において、クリーニングブ

[0062] [カラー電子写真装置のカラー像形成動作] 次に、本実施の形態のカラー電子写真装置におけるカラー像形成時の動作について説明する。

[0063] 本実施の形態のカラー電子写真装置の初期状態において、各プロセスユニット1Bk、1Y、1M、1Cは、図1に示すような位置に配置されている。すなわち、ブラック用のプロセスユニット1Bkは像形成位置50に配置されており、プロセスユニット1Bkの感光体2が中間転写ベルト42の一部に対向した状態にある。この状態において、レーザー露光装置33からブラック用の信号光5であるレーザービームがプロセスユニット1Bkの内部に入射され、感光体2によって中間転写ベルト42にブラックトナー7Bkによる像形成が行われる。この場合、ローラ43、44に印加された電圧の作用によってブラックトナー像が感光体2から中間転写ベルト42に転写されていくことにより、中間転写ベルト42への像形成が行われる。ここで、中間転写ベルト42の速度は、プロセスユニット1Bkの像形成の速度（感光体2の周速に等しい）とほぼ同一となるように設定されている。

[0064] ブラックのトナー像がすべて中間転写ベルト42に転写された直後に、プロセスユニット1Bk、1Y、1M、1Cは移動モータ31に駆動されて一体的に図1の矢印J方向に回転移動する。プロセスユニット1Bk、1Y、1M、1Cは、90°回転してプロセスユニット1Yが像形成位置50に達した時点で停止し、プロセスユニット1Yの位置決めが行われる。

[0065] 上記のようにプロセスユニット1Yが像形成位置50に到達して、位置決めされた後、前述のブラック用のプロセスユニット1Bkと同様に、イエロー用の信号光5によって変調されたレーザービームがプロセスユニット1Yの内部に入射され、イエローのトナー像が感光体2に形成され、中間転写ベルト42に転写される。このとき、中間転写ベルト42は一回転移動しており、前に転写されたブラックのトナー像の上にイエローのトナー像が転写される。ここで、イエロー用の信号光であるレーザービームの書き込みのタイミングは、ブラックのトナー像とイエローのトナー像が位置的に合致するように制御される。

[0066] 以上のイエローの像形成動作と同様の動作は、マゼンタ、シアンについても順次行われ、中間転写ベルト42上には4色のトナー像が位置的に合致して重ね合わされる。これにより、カラー像が形成される。尚、このようにカラー像が中間転写ベルト42上に形成されている間、第2転写ローラ46とクリーナ部19は、図1に示すように、中間転写ベルト42上のトナー像を掻き落とすことにより、中間転写ベルト42から少し離れた位置に離隔されている。

[0067] 最後のシヤンのトナー像が中間転写ベルト42に転写された後、中間転写ベルト42はそのままの

速度で移動し続ける。中間転写ベルト42上に4色のトナーによって形成されたカラー像は、そのカラー像とタイミングを合わせて給紙部47から送られてくる用紙に転写される。すなわち、給紙部47から送られてくる用紙のタイミングに合わせて、第2転写ローラ46が用紙を中間転写ベルト42に圧接し、これにより中間転写ベルト42上のカラー像が用紙に一括して転写される。そして、用紙に転写されたカラー像は、定着部51によって定着される。カラー像が定着された用紙は、排出ローラ52を経て装置外に排出される。

[0068] 中間転写ベルト42上に残った転写残りのトナーは、転写動作終了後のタイミングに合わせて移動したクリーナ部19によって清掃される。クリーナ部19は、転写動作終了後に中間転写ベルト42に圧接された状態となる。このように、本実施の形態においては、クリーナ部19によって中間転写ベルト42が清掃され、次の像形成動作に備えられる。

[0069] [トナー保持動作] 次に、上記のように構成された本実施の形態のカラー電子写真装置において、プロセスユニット群が矢印J方向（図1）に回転することによってトナー保持壁16の作用等について、図3を用いて説明する。図3は本実施の形態のカラー電子写真装置におけるプロセスユニットの動作を説明するための断面図である。

[0070] 図3（1）は、プロセスユニット群が像形成位置50にあるときの姿勢を示している。図3（1）に示すように、トナーホッパー7のトナー収容室、トナー保留室10及びクリーナ部19のそれぞれの内部にはトナーが存在している。

[0071] 前述のようにプロセスユニット群が図1の矢印J方向に回転移動することにより、プロセスユニットの姿勢は順次図3の（2）、（3）及び（4）に示す状態に変化する。このようなプロセスユニットの姿勢変化に伴って、トナーもその自重によって図3の（2）、（3）及び（4）に示すような状態に変化する。

[0072] 図3（1）に示す像形成位置50の状態では、トナー保留室10内に保留されていたトナーは、図3（2）に示す状態から図3（3）に示す状態に移る。このように図3（2）に示す状態から図3（3）に示す状態に移るに伴って、トナー保留室10内のトナーの一部は一旦トナーホッパー7内のトナー収容室に戻されるが、トナー保持壁16の作用により、供給部Sのトナーは供給部Sに保持されたままとなる。

[0073] さらにプロセスユニット群が回転することにより、図3（4）に示すように、トナーホッパー7内のトナー収容室のトナーの一部は再びトナー保留室10に入り込む。そして、プロセスユニットが像形成位置50に戻ったときには、トナー保留室10内は図3（1）に示す適正量のトナーで満たされる。

[0074] 上記のように、プロセスユニット群の一回



(図4のS4)と共に、プロセスユニット群を回転させて印字色用のプロセスユニットを像形成位置50に位置決めする。一方、印字色用のプロセスユニットが像形成位置50にある場合には、そのまま印字が開始される。

像形成位置50にある、例えば、ブラック用のプロセスユニット1Bkは、1枚目のトナー像の像形成を終了した後、そのまま位置で待機して2枚目以降のトナー像を形成していく。すなわち、2枚目以降のトナー像は、1枚目のトナー像がクリーナブラシ49によって消滅された後の中間転写ベルト42上に続けて転写される。

10 [0081]このようにして、4枚目まで画像を出力し停止する。尚、このとき、カウンタには単色の出力枚数が累積される。印字前のカウンタの初期値が「0」であるとする、この場合のカウンタの値は「4」となる。

[0082]続いて4枚ずつの印字を間欠的に7回行う。通算28枚目までの動作は上記したものと同一である。尚、印字後のカウンタの値は「28」である。

20 [0083]この状態においては、図2に示すように、プロセスユニット1Bkの現像部30内のトナー保留室10に溜まっていたブラック用トナー7Bkは28枚の像形成によってその量が少なくなっている。

[0084]さらに続いて4枚の印字を行う。このとき、上記したものと同一動作によって4枚の印字を終了した後、プロセスユニット群を図1の矢印1方向に360°回転させ、もう一度ブラック用のプロセスユニット1Bkを像形成位置50に位置決めして終了する。同時に、カウンタの値をリセットして「0」にする。このため、トナー保留室10には多くの新たなトナーが溜められた状態となる。

[0085]尚、単色印字の間に他の色の単色印字を行った場合や、複色色の印字を行った場合など、プロセスユニット群を回転させるのではなく、カウンタの値はリセットされる。

[0086]以上においては、4枚ずつの単色印字を間欠的に連続して行った場合を例に挙げて説明したが、枚数には関係ない。また、カウンタの累積値が「30」を超えた場合には、その時点で印字を中断してプロセスユニット群を回転させるのではなく、カウンタの累積値が「30」を超えて最初に印字を終了した後に、プロセスユニット群を回転させる。このようにすることにより、少数枚の印字量で印字を中断することなく、保留室10内のトナー量を適切に維持することができ、供給不良を防止することができる。

[0087]また、印字動作中に、カウンタの累積値が所定の値B（ここでは、所定の値Bが「50」に設定されている）に達したか否かが判断される（図4のS5）。そして、カウンタの累積値が「30」を超え、さらにカウンタの累積値が「50」になるまでに印字終了しない場合には、カウンタの値をリセットして「0」にする

[0091]また、上記においては、印字終了後にプロセスカートリッジ群を回転させる場合を例に挙げて説明したが、印字開始前にプロセスカートリッジ群を回転させるようにしても同様の効果を得ることができる。以下、この「印字開始前にプロセスカートリッジ群を回転させる」タイプの印字動作について、図1、図8を用いて説明する。

[0092]まず、単色モードの像形成動作であるか否かが判断され（図5のS21）、単色モードの像形成動作でない場合には、カウンタの値をリセットして「0」にする（図5のS22）。一方、単色モードの像形成動作が行われると判断された場合には、次に、印字色用のプロセスユニットが像形成位置50にあるか否かが判断される（図5のS23）。そして、印字色用のプロセスユニットが像形成位置50にない場合には、カウンタの値をリセットして「0」にする（図5のS24）。一方、印字色用のプロセスユニットが像形成位置50にある場合には、その時点でカウンタの累積値が所定の値A（ここでは、所定の値Aが「30」に設定されている）以上となっているか否かが判断される（図5のS25）。カウンタの累積値が「30」以上であると判断された場合には、プロセスユニット群を回転させると共に（図5のS26）、カウンタの値をリセットして「0」にした後（図5のS27）、印字を開始する。一方、カウンタの累積値が「30」に達しない場合には、そのまま印字を開始する。

[0093]また、印字動作中に、カウンタの累積値が所定の値B（ここでは、所定の値Bが「50」に設定されている）に達したか否かが判断される（図5のS28）。そして、カウンタの累積値が「30」を超え、さらにカウンタの累積値が「50」になるまでに印字を終了しない場合には、カウンタの累積値が「50」を超えた時点で、印字途中であっても一旦印字動作を停止し（図5のS29）、プロセスユニット群を回転させて（図5のS30）、もう一度ブラック用のプロセスユニット1Bkを像形成位置50に位置決めすると共に、カウンタの値をリセットして「0」にした後（図5のS31）、残りの印字を行う（図5のS32）。尚、印字動作中に、カウンタの累積値が所定の値Bに達しない場合には、続けて印字動作が行われる。

[0094]次に、印字を終了するか否かが判断される（図5のS33）、印字を終了する場合には、そのまま印字を終了する。

[0095]「カラー電子写真装置のメンテナンス」次に、本装置の形態のカラー電子写真装置におけるメンテナンスについて、図6を用いて説明する。図6は操作画面を開いて、シアン用のプロセスユニット1Cを引き出した状態を示す断面図である。以下に、特定の色、例えばシアンのトナーが消費されてなくなってしまう場合等想定して、その場合のメンテナンスについて説明する。

た時点で、印字途中であっても一旦印字動作を停止し（図4のS6）、プロセスユニット群を回転させて（図4のS7）、もう一度ブラック用のプロセスユニット1Bkを像形成位置50に位置決めると共に、カウンタの値をリセットして「0」にした後（図4のS8）、残りの印字を行う（図4のS9）。例えば、カウンタの累積値が「28」のとき、続いて30枚連続印字する場合、22枚印字しカウンタの累積値が「50」になった時点で、一旦印字動作を停止してプロセスユニット群を回転させた後、残りの8枚を印字する。このようにすることにより、多数枚の連続印字を行う場合であっても、保留室10内のトナー量を適切に維持することができる。尚、印字動作中に、カウンタの累積値が所定の値Bに達しない場合には、続けて印字動作が行われる。

[0088]次に、印字を終了するか否かが判断される（図4のS10）、印字を終了する場合には、その時点でカウンタの累積値が所定の値A（ここでは、所定の値Aが「30」に設定されている）以上となっているか否かが判断される（図4のS11）。カウンタの累積値が「30」以上であると判断された場合には、プロセスユニット群を回転させると共に（図4のS12）、カウンタの値をリセットして「0」にした後（図4のS13）、印字を終了する。一方、カウンタの累積値が「30」に達しないとは判断された場合には、そのまま印字を終了する。

[0089]上記のように、単色モードの累積枚数をカウンタに累積し、カウンタの累積値が所定の値Aを超えた場合には、その印字が全て終了した後にプロセスユニット群を一旦一回転させる。また、その印字の終了前にカウンタの累積値が所定の値B（>A）になった場合には、その時点で一旦印字動作を停止し、プロセスユニット群を1回転させた後、残りの印字を行う。このようにすることにより、単色モードにおいて、少数枚の印字途中で印字が中断されることなく、また、多数枚を間欠的にあるいは連続して印字する場合においても、トナー保留室10内に常に適切な量のトナーが保留され、トナーの供給不足になることはない。また、プロセスユニット群の回転動作を最小限に抑えることが可能となる。

[0090]尚、設定値A及びB（>A）の値については、ユーザー間で適宜変更することができるようにされている。例えば、文字画像などのブラック領域の少ない画像を多く出力する場合には、A=60、B=100に設定し、逆に図形などのブラック領域の多い画像を多く出力する場合に、上記のようにA=30、B=50に設定することができる。このようにすることにより、出力画像に応じて、必要最小限のプロセスカートリッジ群の回転動作により、トナー保留室10内のトナーの量を適切に維持することができ、供給不良を防止することができる。

転ごとに、供給部Sの比較的高電圧のトナーはその場所に保持される。トナー保留室10内他のトナーは、一旦トナーホッパー7内のトナー収納室に戻された後、再び新たにトナーホッパー7内のトナー収納室の一部のトナーがトナー保留室10に入り込み、トナー保留室10はトナーで満たされる。

[0075]以上のように、本実施の形態のカラー電子写真装置によれば、プロセスユニットにトナー保留室10が設けられ、かつ供給部Sのトナーを画びねるようにトナー保留室16が設けられていることにより、プロセスユニットの回転移動中に、トナー保留室10とトナーホッパー7内のトナー収納室との間のトナーの移動を許容しながら、比較的高電圧でいる供給部Sのトナーをトナーホッパー7内のトナー収納室に戻すことなく、高電圧高電圧において保持することができる。従って、高電圧高電圧においても、また、多数枚印字後においても、トナーの帯電が安定し、漏洩電圧やカブリ等の発生しない美しい画像が得られる。

[0076]「単色モード時の写真像動作」次に、本実施の形態のカラー電子写真装置における単色モード時の写真像動作について、図1を用いて説明する。

[0077]単色モード時の写真像動作に際しては、まず、プロセスユニット群を回転させ、所望の色のプロセスユニットを像形成位置50に移動させて位置決めする。そして、前述のカラー写真像動作の場合と同様に、所望の色のトナー像を感光体2に形成し、中間転写ベルト42への転写を行う。単色モード時の写真像動作において、中間転写ベルト42は転写後そのまま続けて移動し、第2転写ローラ46の押圧動作により、中間転写ベルト42上のトナー像が給紙部47から送られてくる用紙に転写されていく。このとき、第2転写ローラ46は、中間転写ベルト42上のトナー像の先端が近くタイミングに合わせて、中間転写ベルト42に圧接した状態となる。

[0078]「単色モード時の間欠写真像動作」次に、本実施の形態のカラー電子写真装置において、ブラックの画像を4枚ずつ間欠的に出力する場合の動作について、図1、図4を用いて説明する。

[0079]この場合、第2転写ローラ46及びクリーナブラシ49は、それぞれ中間転写ベルト42上に圧接されたままの状態を維持する。

[0080]まず、単色モードの像形成動作であるか否かが判断され（図4のS1）、単色モードの像形成動作でない場合には、累積手段であるカウンタ（図4のS2）の値をリセットして「0」にする（図4のS2）。一方、単色モードの像形成動作が行われると判断された場合には、次に、印字色用のプロセスユニットが像形成位置50にあるか否かが判断される（図4のS3）。そして、印字色用のプロセスユニットが像形成位置50になって、印字動作中に、カウンタの値をリセットして「0」にする

【0096】まず、作業者からの指令（図示しないスイッチにより、移動モータ31がプロセスユニット群を回転させる。そして、メンテナンステキプロセスユニットを上部位置（図1のプロセスユニット1Cの位置）に移動させる。次に、図4に示すように、作業者は装置本体上部の操作部460を開放し、メンテナンステキプロセスユニットのみを装置外に取り出す。次に、予めプロセスユニットとして調整済みの新しい該当する色用のプロセスユニットを同じ位置に装着する。このように、同じ形状のプロセスユニットを交換しただけであるので、新しいプロセスユニットの装着後において、何らの調整をすることなく、同じように像形成を続けることができる。

【0097】本実施の形態のカラー電子写真装置において、交換すべきプロセスユニットは像形成位置とは異なる位置で交換できるため、駆動機構等の駆動部に邪魔されることはない。また、交換できる状態のプロセスユニットは位置決めされていないため、容易に装置外に取り出すことが可能である。従って、本実施の形態のカラー電子写真装置は、メンテナンステキに優れた装置となっている。

【0098】尚、上記実施の形態においては、感光体、現像手段及びクリーナ部が一体的に組み込まれたプロセスユニットを回転移動させる構成のカラー電子写真装置を例に挙げて説明したが、本発明は必ずしもこの構成のカラー電子写真装置のみに適用されるものではない。例えば、プロセスユニットとして現像手段のみを備え、この現像手段を固定した1つの感光体に対向する像形成位置まで回転移動させる方式のカラー電子写真装置等にも、本発明を適用することができる。同様の効果を得ることができる。

【0099】以上説明したように、本発明によれば、簡単な構成で、高温高湿環境下においても、また、多数枚印字後においても、過度むらやカブリのない優れたカラー画像形成装置及びプロセスユニットを供給することができ、また、本発明によれば、単色連続印字において、画像出力時間の無駄がなく、トナー供給のための動

作を最小限に抑えることができる優れたカラー画像形成装置を実現することができる。

【図面の簡単な説明】

【図1】本発明の一実施の形態におけるカラー画像形成装置としてのカラー電子写真装置の全体構成を示す断面図

【図2】本発明の一実施の形態におけるブラック用のプロセスユニットを示す断面図

【図3】本発明の一実施の形態のカラー電子写真装置におけるプロセスユニットの動作を説明するための断面図

【図4】本発明の一実施の形態におけるカラー電子写真装置の単色モード時の開孔駆動動作を示すフローチャート

【図5】本発明の一実施の形態におけるカラー電子写真装置の単色モード時の開孔駆動動作の他の例を示すフローチャート

【図6】本発明の一実施の形態のカラー電子写真装置のメンテナンステキ時の動作を説明するための断面図

【図7】従来技術におけるカラー画像形成装置としてのカラー電子写真装置の全体構成を示す断面図。

【符号の説明】

1 Bk ブラック用のプロセスユニット

1 Y イエロー用のプロセスユニット

1 M マゼンタ用のプロセスユニット

1 C シアン用のプロセスユニット

2 感光体

10 トナー保留室

12 現像ローラ

13 ドクターブレード

14 供給ローラ

15 トナー保留壁

16 トナー保持壁

19 クリーナ部

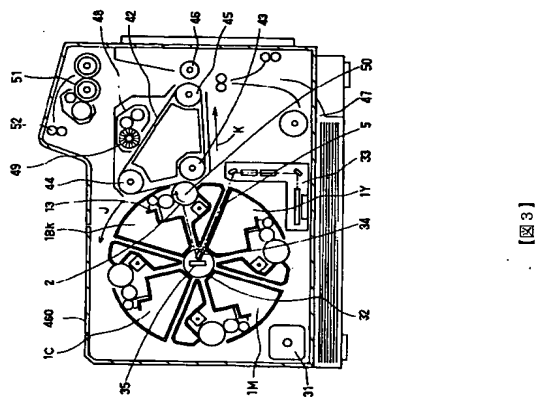
30 現像部

33 レーザ露光装置

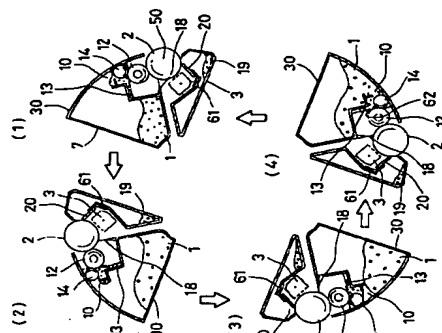
42 中間転写ベルト

46 第2転写ローラ

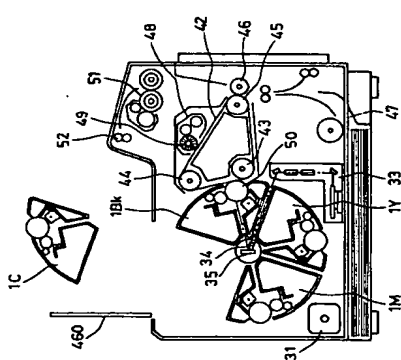
【図1】



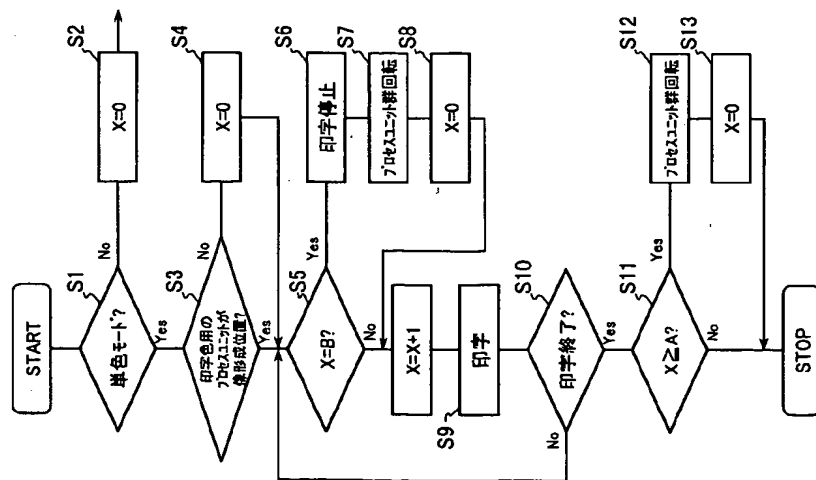
【図3】



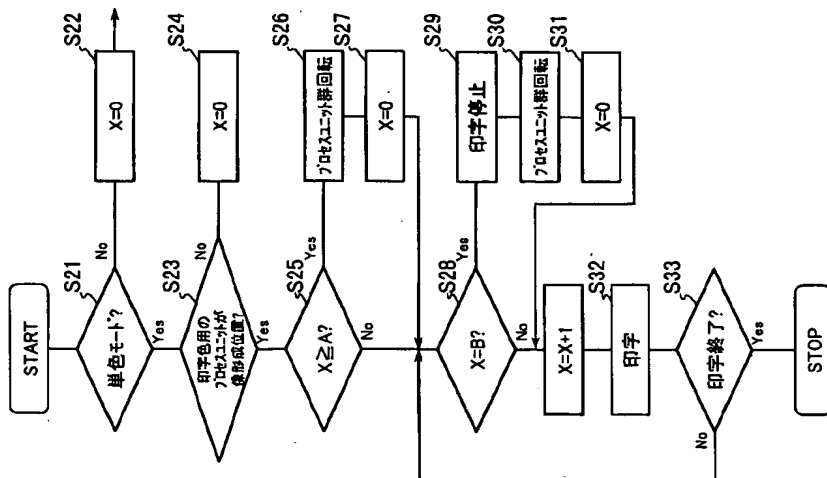
【図6】



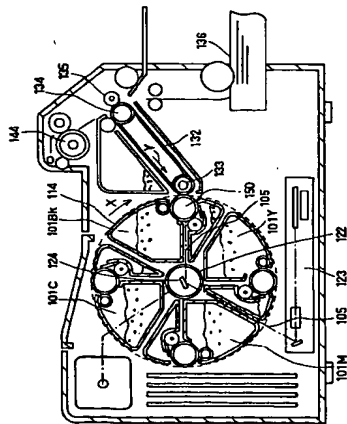
【図 4】



【図 5】



【図 7】



フロントページの続き

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|---------|------------------|----------|--------------------------------|
| (72)発明者 | 武内 敬三            | Fターム(参考) | 2H030 AB02 AD05 AD17 BB02 BB23 |
|         | 大阪府門真市大字門真1006番地 |          | BB33 BB42 BB46 BB71            |
|         | 産業株式会社内          |          | 2H077 AA12 AA15 AA18 AC04 AD02 |
| (72)発明者 | 谷 繁満             |          | AD06 BA03 DA05 DA12 DA87       |
|         | 大阪府門真市大字門真1006番地 |          | DB01 GA02 GA13                 |
|         | 産業株式会社内          |          |                                |